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PEACH JUICE AND POMACE POWDER; NUTRITIVE VALUE AND USE OF POMACE POWDER IN BISCUITS

SANGEETA SINGH & KALPANA KULSHRESTHA

Department of Foods and Nutrition, College of Home Science, GBPUAT, Pantnagar

ABSTRACT

Peaches are well known for higher content of carotenoids (provitamin A), and phenolic compounds. Experiments were conducted to evaluate the nutrient content of peach juice and powder made from the residue and it was found to be 82.23 per cent and 17.066 per cent moisture in juice and powder, the ash content was found 1.65 per cent and 2.07 per cent respectively, crude protein was 1.87 per cent and 1.184 per cent respectively, per cent ether extract was found to be 0.183 per cent and crude fiber is 2.27 per cent of peach powder. The average total soluble content of peach juice was estimated to be 23.33^{0}Brix. The vitamin C content was estimated to be 15.44 mg per 100 gm in peach pomace powder, β- Carotene content was found to be 445 and 450 µg per 100gm in juice and powder. The DPPH activity was found to be 82.03 per cent in juice and to be 81.05 per cent peach pomace powder. The estimation of minerals was also carried out. Calcium was calculated to be 33.33 mg per 100 gm, Iron 2.51 mg per 100gm and Phosphorus 36.33 mg per 100gm in peach powder. From peach powder the development of baked product (biscuits) was also carried out. Six trials were done to develop the standard recipe of biscuit. With regular practice on biscuits preparation the dimensions (width, diameter and weight) were found to be constant. In the preparation of biscuits 15 per cent peach powder was incorporated which contained 4.99 mg Ca, 0.3765 mg Fe and 5.44 mg P. Sensory evaluation of control and Peach biscuits was done by using paired comparison test. Out of 30 panelists 29 like the peach pomace biscuits and one like the control one. Paired comparison test was followed by paired t-test, the value was estimated to bet$_{cal}$ =2.405. So, we can say that the null hypothesis that is acceptability of the two sample were equal was rejected because the value was not in a range of -1.83 to +1.83 and the alternate hypothesis was accepted that is acceptability of peach pomace biscuits was more than control one.

KEYWORDS: Peach, Juice, Pomace, Pomace Powder, Nutritive Value, Sensory Evaluation

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Original Article

INTRODUCTION

Peach fruit has been demonstrated to contain vitamin A, vitamin B1, vitamin B2, and niacin. Peaches also contain the minerals calcium, phosphorus, iron, and potassium. It contains higher quantity of ascorbic acid (vitamin C). In recent years, as increased public concern about health, the fruit nutritional value is an important parameter which ascribes fruit quality precisely. Peaches are well known for higher content of carotenoids (pro-vitamin A), and phenolic compounds which are sources wise peachy in antioxidants (Tomas *et al*., 2001; Byrne, 2002). It is believed that antioxidants are important health considerations in maintaining healthy bodies. Increased contents of antioxidants in nutrition have also been reported to be assistive in scaling down cardiac risks (Verlangieri*etal*., 1985), human's body blood pressure (Ascherio*etal*., 1992) and lethal occurrence of cancer (Willet, 1994).

At the same time fruits having increased levels of antioxidants resultantly show increased storability with decreased concentration of phenols (browning). Peach fruit kernel is used to regulate blood circulation and beneficial use during chronic constipation (Hou and Jin, 2005).

Peaches become available in early summer to the market and fill market with its fresh and pleasing arrival and that is why it becomes profitably (commercial) a significant stone fruit crop. But less attention has been paid to the production of peach fruit crop, chiefly because of its perishability and short postharvest life during storage. It has been estimated that there are about 17-40% losses in horticultural crops (Rind, 2003).

These losses start right from the harvest and result in great losses in terms of not only quantity but quality as well. Main reasons in post-harvest deterioration of fruits quality and vegetables are preharvest cultural measurements like improper selection of rootstocks and scions, un improved production practices, injudicious use of fertilizer, pests and diseases management, lack of skill for harvesting of crop at proper stage, and postharvest storage problems suchlike non removal of field heat, negligence regarding management of hygienic problems, improper promotional materials (packaging) and grading of fruits, poor transport conditions, storage and marketing approaches (Kader, 2002).

The present study was carried out to evaluate the nutritional value of Peach Juice and Peach pomace powder *(Prunuspersica)* and utilization of peach pomace in biscuits as nutritional supplements.

MATERIALS AND METHODS

Preparation of Peach Juice and Peach Pomace Powder

Fresh yellowish red colour peaches from local market were thoroughly washed under stream of continuous flowing tap water so as to remove the adhering soil and other extraneous matters. Peaches are peeled manually with a sharp stainless steel hand peeler. They were vertically cut into small pieces and kept in KMS sol. for 15min. in order to prevent browning. Then the pieces are passed through an electrically operated Juicer.

The whole lot was Pasteurized to 95^0C. Then we added the preservative KMS @ 350ppm. Hot filling of juice in the glass bottles and capping was done. Then heat processing is done at 121 ^{0} C for 20 minutes, then finally cooling and storage at refrigerated temperature was done. Two products were obtained, the first was Juice and the second was Pomace. From pomace the powder was prepared by drying it in 50^oC for 17-18 hrs, ground to powder properly in an electrically operated grinder and then sealed and kept it in dry place to prevent it from moisture gain.

Nutritional Composition

This includes the determination of the percentages of moisture, total solids, total ash, crude protein, and crude fat and crude fiber as per AOAC (1995) procedure. Vitamin C determination was done as per the method described in AOAC (1995), the β-carotene content of sample was estimated by Goodwin (1995). Calcium determination was done as per the method described in AOAC (1995). Iron determination was done calorimetrically by Wong's method as quoted by Ranganna (1986). Estimation of phosphorus was done by the method given by Fiske and Subbarow (1925). Antioxidant activity was determined by DPPH radical described by Williams *et al*., (1995).

Development of Standard Recipe

The biscuits were prepared according to the recipe given by Thangam E. Philip (1965) with slight modifications**.** Firstly the standardization of the recipe for control was made followed by the 15% incorporation with peach powder.

The basic recipe for biscuit is given below:

Biscuits Raw Materials

White flour	100g
Sugar	45g
Butter	85g
Milk	1/3 cup
Common salt	½ teaspoon
Baking powder	1 and ½ teaspoon
Vanilla	0.2 ml

Method

Sugar and fat were creamed in a mixer. To this, a well-mixed blend of white flour, common salt and baking powder were added along with milk containing vanilla essence and the contents were mixed further for 2 minutes to make dough using a wooden rolling pin, the dough was sheeted on a specially fabricated aluminium platform to a uniform thickness. Circular biscuits were cut and baked for 10 minutes at 150 ºC in a baking oven.

Optimization of the Basic Recipe

Optimization of the basic recipe was done for control as well as for 15% incorporation with respect to peach powder used in the preparation of dough. Biscuits were evaluated for sensory characteristics using paired comparison test. Sensory evaluation was done by a panel consisting of 30 members from the Department of Foods and Nutrition. We used the Paired comparison test and Paired t- test as given by E. Larmond (1985),

RESULTS

Outcome of the various experiments conducted during the course of study is presented below

Nutritional Composition

This includes analysis of the samples for moisture, crude protein, crude fat, crude fiber, total ash and total soluble solids. The results have been presented in Table 1 and 2.

Moisture and T.S.S

The average moisture content was 82.33% and 17.066% recorded in the Peach juice and Peach pomace powder respectively and average Total soluble solids in Peach juice was recorded to be 23.33 ^{0}Brix. Almost similar observations had been recorded by several workers like (Parmar and Kaushal, 1982) reported slightly less moisture content of 79-81% in Peach juice and 10-15% moisture in Peach powder, (Campbell *et al*, 2010) reported slightly more moisture content of 87.9% in Peach juice,(Pagan*et al*,2001) recorded less moisture content of 7% in Peach pomace powder and (Bhakshi and Masoodi,2009) has recorded 11.6 ^{0}Brix T.S.S which was quite low in Peach juice.

Total Ash

The total ash which consists of inorganic constituent is the residue that remains after the organic matter has been burnt away. The data presented in Table 1 and 2 shows that the total ash content was 1.65% in Peach juice and 2.07% in Peach powder. (Parmar and Kaushal, 1982) found ash content of 1.63% in Peach juice that was slightly less and (Pagan*et al*, 2001) recorded slightly high ash content of 3% in Peach pomace powder.

Crude Protein

The crude protein was found to be 1.87 % in Peach juice and 1.184% in Peach powder (Parmar and Kaushal, 1982) found 2% protein in Peach juice that was slightly more.

Crude Fat

The average crude fat content was found 0.183% in Peach pomace powder. Almost similar observation has been recorded by (Ashraf, et al 2011) reported slightly more crude fat content of 0.232%.

Crude Fiber

The average crude fiber content was found to be 2.27% in Peach pomace powder. Almost similar observation has been recorded by (Ashraf, et al 2011) reported slightly less crude fiber content of 1.994%.

Table 1: Nutritive Value of Peach Juice

Product Name	Moisture (%)	Total Ash (%)	Crude Protein (%)	T.S.S(^{0}Brix)
Peach Juice	82.2	1.620	1.875	23
	82.3	1.712	1.875	24
	82.2	1.619	1.865	23
Mean	82.233	1.650	1.871	23.33
S.D	0.577	0.519	0.005	0.577

Table 2: Nutritive Value of Peach Pomace Powder

Product Name	Moisture (%)	Total Ash (%)	Crude Protein (%)	Crude Fat (%)	Crude Fiber (%)
Peach Powder	17.00	2.14	1.182	0.1499	2.32
	17.20	2.06	1.184	0.1997	2.21
	17.00	2.02	1.185	0.1997	2.30
Mean	17.066	2.0733	1.184	0.1831	2.27
S.D	0.115	0.061	0.001	0.028	0.058

Vitamins

Vitamins are organic substances present in small amount in many foods. They are required for carrying out many vital functions of the body and many of them are involved in the utilization of the major nutrients like proteins, fat and carbohydrates. Although they are needed in small amounts, they are essential for health and wellbeing of the body.

Ascorbic Acid

It is clear from the data presented in Table 3 that the ascorbic acid content of Peach juice was found to be 10.55 mg/100 gm and later on decreased by 12-13% in first three months to 9.62 mg/100gm and again it was decreased by 13% in next three months to 8.356 mg/100g. There was a total loss of around 20% within six month.

The ascorbic acid content of Peach pomace powder was found to be 15.44 mg/100 gm and later on decreased by 12-13% in first three months to 14.02 mg/100gm and again it was decrease by 11% in next three months to 12.366 mg/100g. There was a total loss of around 19% within six month.

Almost similar observations have been recorded by (Sharma *et al*, 1994) recorded 13.54 mg/100gm in Peach juice which was slightly more.

Table 3: Ascorbic Acid Content in Peach Juice and Peach Pomace Powder at different Intervals of Time

S. No	Ascorbic Acid (mg/100gm) Initial	Ascorbic Acid (mg/100gm) After Three Months	Ascorbic Acid (mg/100gm) After Six Months
Peach Juice	10.54	9.61	8.355
	10.57	9.64	8.359
	10.54	9.61	8.355
Mean	10.55	9.62	8.356
S.D	0.017	0.017	0.002
Peach Pomace Powder	15.44	14.04	12.38
	15.42	14.02	12.36
	15.47	14.02	12.36
Mean	15.445	14.0266	12.366
S.D	0.025	0.011	0.011

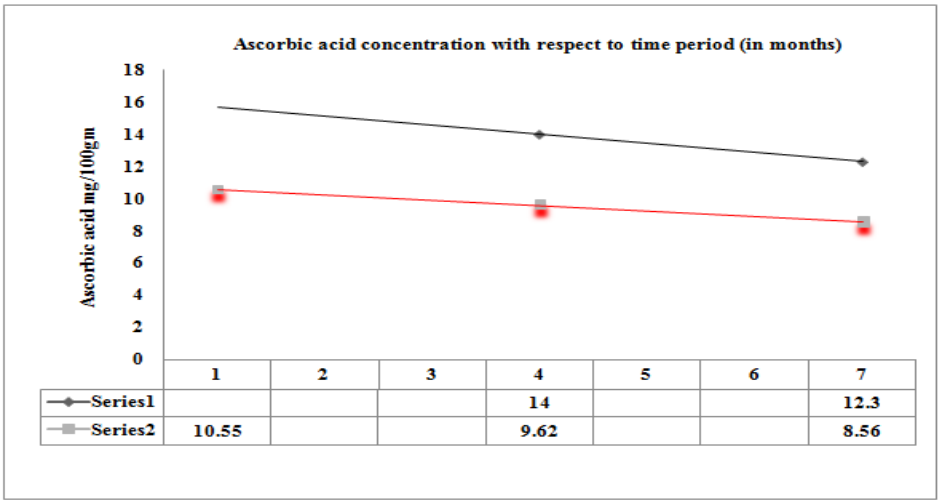


Figure 1: Vitamin C Content of Peach Juice and Peach Pomace Powder

β-Carotene

The β-carotene was recorded to be 445 µg/100gm in peach juice and 450 µg/100gm in Peach powder. The study done by (Campbell *et al*, 2010) had recorded β-carotene of juice in the range of 290-650 µg/100 gm in different varieties of Peaches.

Table 4: β-Carotene Present in Peach Juice and Peach Pomace Powder

Product Name	µg of β-Carotene /100 gm
For juice	445.00
For powder	450.20

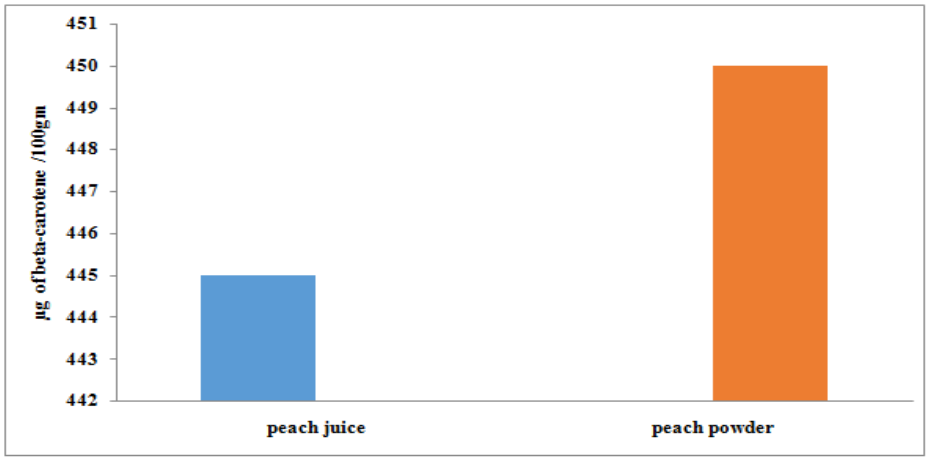


Figure 2: β-Carotene in µg/100gm in Peach Juice and Peach Pomace Powder

Minerals

Minerals catalyzes for many biological reactions within the human body, they are necessary for transmission of messages through the nervous system, digestion, &metabolism or utilization of all nutrients in foods. Vitamins cannot be properly assimilated without the correct balance of minerals.

Calcium Estimation

Calcium content of Peach pomace powder had analyzed and the data has been presented in Table 4.5. The average calcium content was recorded 33.33mg/100gm. (Parmar and Kaushal, 1982) found Calcium content of 39mg/100gm which was high.

Iron Estimation

The data presented in Table 4.5 shows that the Iron content in Peach pomace powder was 2.512 mg/100 g. almost similar observations have been recorded by (Ashraf, et al 2011) reported the iron content of 1.35mg/100gm which was slightly lower.

Phosphorus Estimation

The data presented in Table 4.5 revealed that the Phosphorus content in peach pomace powder was estimated to be 36.33mg/100gm almost similar observations have been recorded by (Ashraf, et al, 2011) reported the phosphorus content of 35mg/100gm which was slightly less.

Table 5: Minerals Content in Peach Pomace Powder

Product Name	Calcium in mg per 100gm	Iron in mg per 100gm	Phosphorus in mg per 100gm
Peach Powder	32	2.510	35.00
	32	2.510	35.00
	36	2.517	39.00
Mean	33.33	2.512	36.33
S.D	2.309	0.004	2.309

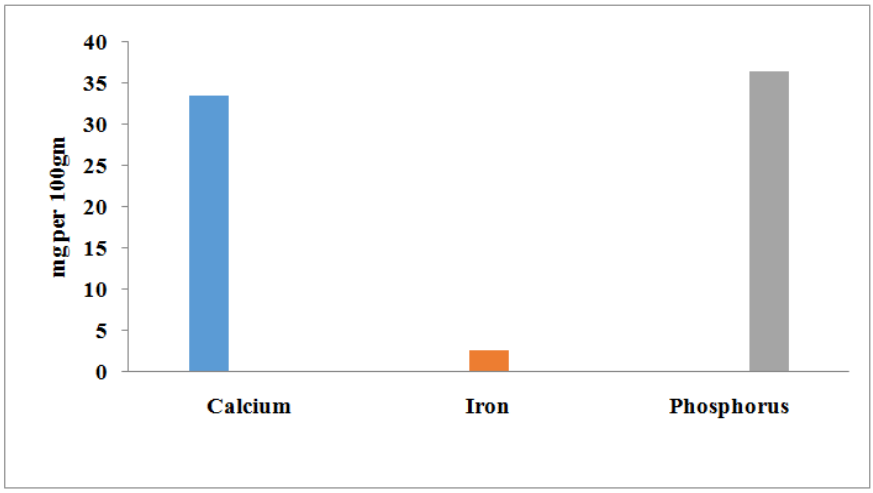


Figure 3: Calcium, Iron and Phosphorus Content of Peach Pomace Powder

Antioxidant Activity

Antioxidants are compounds that inhibit or delay the oxidation of other molecules by inhibiting the initiation or propagation of oxidizing chain reactions (Klein, 2000).

The Food and Nutrition Board of the National Academy of Science defined a dietary antioxidant as a substance in foods that significantly decreases the adverse effects of reactive oxygen species, reactive nitrogen species, or both on normal physiological function in humans. Natural phenolic antioxidants can scavenge reactive oxygen and nitrogen species (RONS) thereby preventing the onset of oxidative diseases in the body.

The total antioxidant activity of plant foods is the result of individual activities of each of the antioxidants compounds such as vitamin C, tocopherols, carotenoids and phenolic compounds (Javanmardi*et al.*, 2003 and Pizzale*et al.*, 2002).

Peaches are well documented for higher content of ascorbic acid, carotenoids (provitamin A), and phenolic compounds which are believed to serve as antioxidants (Barberan*et al.*, 2001; Byrne, 2002).

Vitamin C in humans must be ingested for survival. Vitamin C is an electron donor, and this property accounts for all its known functions. As an electron donor, vitamin C is a potent water-soluble antioxidant in humans. Human diseases such as atherosclerosis and cancer might occur in part from oxidant damage to tissues (Padayatty*et al.*, 2003).

Beta carotene has potential antioxidant biological properties due to its chemical structure and interaction with biological membranes (Riccioni, 2009). There are several dozen carotenoids in the foods that we eat, and most of these carotenoids have antioxidant activity. Numerous epidemiological studies have suggested an inverse relationship between intake of beta carotene, fruits and vegetables, particularly raw fruits and vegetables and dark green, leafy and cruciferous vegetables, and the risk of oesophageal adenocarcinoma and Barrett's oesophagus (Kubo *et al.*, 2010).

DPPH Scavenging Activity

DPPH assay is widely used for the evaluation of antioxidant activity of biological samples. The working principle of this assay is based on discoloration of DPPH free radical upon reacting with hydrogen donating species *i.e.*, antioxidants present in plant extracts (Krishnaiah *et al.*, 2011). The principle for the reduction of 1, 1- diphenyl-2-picryl hydrazyl

(DPPH) free radical is that, the antioxidant reacts with stable free radical, DPPH and converts it to 1, 1-diphenyl–2-picryl hydrazine.

The data on DPPH activity of Peach juice and Peach pomace powder has presented in Table 6.

The data clearly shows that the DPPH activity of Peach juice was 82.03% in first month then it increased to 86.11% and 89.99% in 3rd and 6th month, overall 9.7% increase in DPPH activity had been recorded. The DPPH of Peach pomace powder was recorded to be 81.05% in first month and it also increased to 85.09% and 89.01% in 3rd and 6th month, overall 7.9% increase in DPPH activity had been recorded wit in six month in Peach pomace powder.

Almost similar observation had been recorded by Ashraf, et al 2011who reported 86.05% DPPH activity in Peach juice and (Tsantili et al., 2010) had also recorded the nearly same DPPH activity 86.01% in Peach pomace powder.

Table 6: DPPH Activity at different Intervals of Time

Product Name	DPPH Activity (%) Initially	DPPH Activity (%) After Three Months	DPPH Activity (%) After Six Months
Juice	82.03	86.11	89.99
Powder	81.05	85.09	89.01

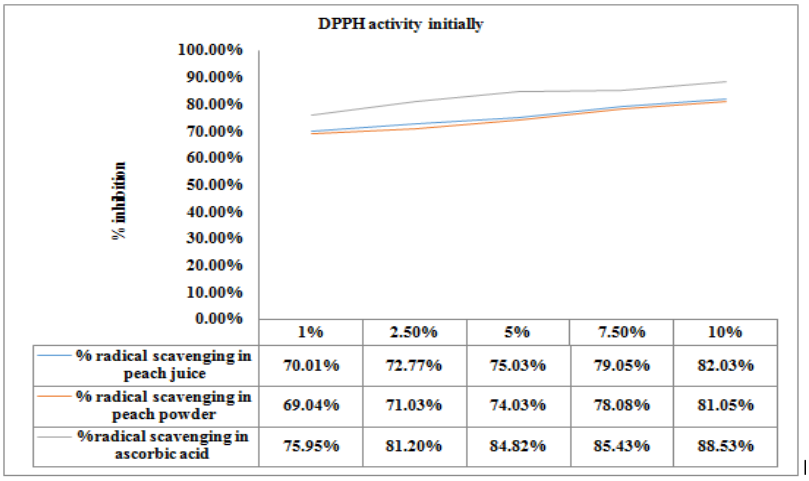


Figure 4: DPPH Activity of Peach Juice and Peach Pomace Powder Initially

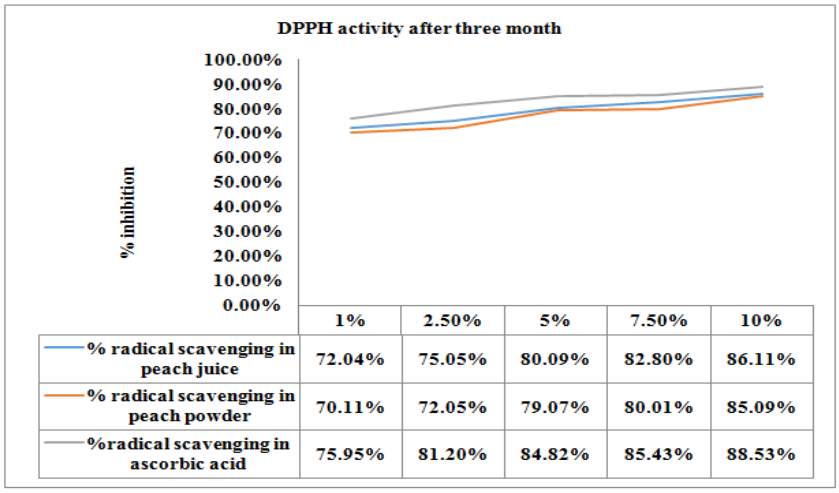
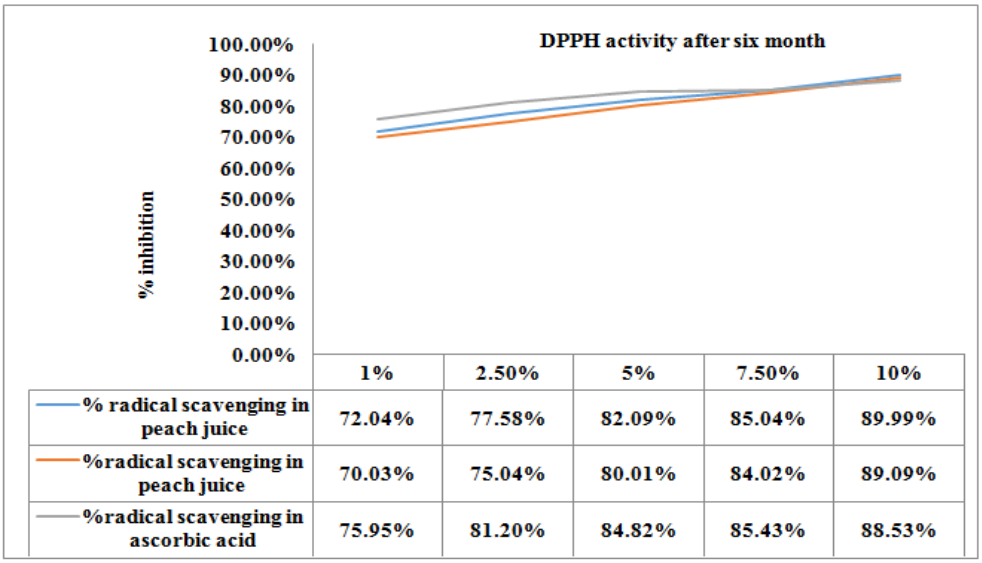


Figure 5: DPPH Activity of Peach Juice and Peach Pomace Powder after Three Months



	1%	2.50%	5%	7.50%	10%
% radical scavenging in peach juice	72.04%	77.58%	82.09%	85.04%	89.99%
%radical scavenging in peach juice	70.03%	75.04%	80.01%	84.02%	89.09%
%radical scavenging in ascorbic acid	75.95%	81.20%	84.82%	85.43%	88.53%

Figure 6: DPPH Activity of Peach Juice and Peach Pomace Powder after Six Months

Development of Standard Recipe

The regular practice of biscuit preparation was carried out many times and from the measurement of its physical dimensions it is very clear that with regular practice and experience the dimensions (width, diameter $ weight) of biscuits were coming uniform after practicing. Initially the deviations observed in dimension were very wide for example diameter varied from 4.2 cm to 4.5 cm while with regular practice the diameter was constant that was 4.7 cm. So, these trials were done to develop standard recipe of biscuits. As it can be seen in table no. 4.7 the number of different trials has been done to develop a standard recipe for Biscuits.

Table 7: Dimensions of Biscuits

First Trial			
S. No	**Diameter(cm)**	**Width(cm)**	**Weight(gm)**
1	4.2	0.7	5.010
2	4.4	0.6	6.040
3	4.5	0.6	6.468
4	4.5	0.6	5.645
5	4.3	0.6	5.872
6	4.5	0.5	4.375
Second Trial			
S. No	**Diameter(cm)**	**Width(cm)**	**Weight(gm)**
1	4.4	0.5	4.947
2	4.4	0.4	3.697
3	4.4	0.4	3.738
4	4.4	0.5	5.627
5	4.4	0.5	5.512
6	4.4	0.4	4.908
Third Trial			
S. No	**Diameter(cm)**	**Width(cm)**	**Weight(gm)**
1	4.5	0.7	9.341
2	4.7	0.7	8.529
3	4.7	0.8	9.739

Table 7: Contd.,			
4	4.6	0.7	7.020
5	4.7	0.8	9.952
6	4.8	0.7	8.960
Fourth Trial			
S. No	**Diameter(cm)**	**Width(cm)**	**Weight(gm)**
1	4.6	0.6	9.991
2	4.6	0.8	10.363
3	4.7	0.7	9.243
4	4.7	0.7	10.711
5	4.7	0.8	10.399
6	4.7	0.7	8.265
Fifth Trial			
S. No	**Diameter(cm)**	**Width(cm)**	**Weight(gm)**
1	4.7	0.7	9.477
2	4.7	0.7	9.075
3	4.6	0.7	8.032
4	4.7	0.7	9.457
5	4.7	0.6	7.895
6	4.7	0.6	7.320
Sixth Trial			
S. No	**Diameter(cm)**	**Width(cm)**	**Weight(gm)**
1	4.7	0.7	9.888
2	4.8	0.7	9.599
3	4.7	0.7	9.232
4	4.7	0.8	9.859
5	4.7	0.8	9.860
6	4.7	0.8	9.854

Sensory Evaluation by Paired Comparison Test

The Paired Comparison test wants to determine whether two products differ in a specified attribute, such as sweetness, crispness, yellowness, etc.

Two differently coded samples are presented to each panelist simultaneously and the panelist's task is to choose the one that is perceived as higher or more intense in the specified sensory attribute. The paired comparison implicates the "forced" choice and therefore the judges must give an answer in any case.

The two samples, 112 and 121, are presented in two possible serving sequences (112 and 121). These sequences must be randomized across panelists with each sequence appearing an equal number of times.

The use of 30 assessors is recommended to test for difference.

The Paired Comparison test is also used inpreference testsin which the judge's task is to choose which of two samples is more appealing or more acceptable on a sensory dimension.

We have taken the sample of 30 people and from the below graph we can see that out of 30 panelist 29 like the appearance, odour, texture, taste and touch of Peach pomace Biscuits and 1 panelist like the control Biscuits. The results of Paired Comparison test was clearly shown in figure**7.**

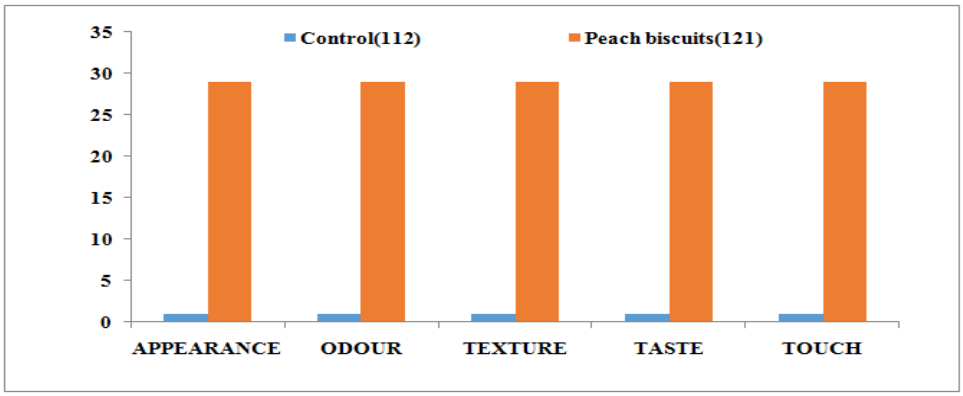


Figure 7: Graph Showing the Values of Paired Comparison Test

Figure 8: Peach Biscuit on Left Side and Control on Right Side

Figure 9: Peach Powder Obtained from Peach Pomace and Peach Juice

Paired t- Test

A paired t-test measures whether means from a within-subjects test group vary over 2 test conditions. The paired t-test is commonly used to compare a sample group's scores before and after an intervention (Altman DG, 1991).

From the table no 4.8, we calculated $\mathbf{t_{cal}}$ = 2.405 so, it is clear that first assumption is rejected (H_O) and second is accepted (H_1). So, Peach Biscuits are more acceptable than control one.

Table 8: Estimated value of t_{cal}

Parameters	Control(x_i)	Peach (y_i)	$d_i(x_i-y_i)$	d_i^2	$\bar{d}$	S^2	t_{cal}
Appearance	1	29	28	784	4.667	112.64	2.405
Odour	1	29	28	784			
Texture	1	29	28	784			
Taste	1	29	28	784			
Touch	1	29	28	784			

Experiments were conducted to evaluate the nutrient content of juice and powder and it was found to be 82.23% and 17.066% moisture in juice and powder, the ash content was found 1.65% and 2.07% respectively, crude protein was 1.87% and 1.184% respectively, % ether extract was found to be 0.183% and crude fiber is 2.27 % of peach powder. The vitamin C content was initially estimated to be 10.55 mg /100gm in peach juice, β- Carotene content was found to be 445 and 450 µg/100gm in Juice and Powder. The DPPH activity was initially found to be 82.03% Juice. as initially estimated to be 15.44 mg/100 gm in peach pomace powder The DPPH activity was initially found to be 81.05% Peach pomace. The estimation of minerals was also carried out. Calcium was calculated to be 33.33 mg/100 gm, Iron 2.51 mg/100gm and Phosphorus 36.33 mg/100gm in peach powder. In the preparation of biscuits 15% peach powder was incorporated so it was found 4.99 mg Ca, 0.3765 mg Fe and 5.44 mg P was present in 15 gm peach powder. The total 10.806 mg/15 gm was present in peach powder.

CONCLUSIONS

From peach powder the development of baked product (biscuits) was also carried out. Six trials were done to develop the standard recipe of biscuit. With regular practice on biscuits preparation the dimensions (width, diameter $ weight) were found to be constant. Sensory evaluation showed peach pomace biscuits were more acceptable than control one.

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